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them. This precaution should always be taken if the higher algæ are wanted.

6. Even if the vegetative portions should disappear, it is better not to throw away the material, unless it is foul with the small, dark blue *Oscillatoria*. Often after a period of rest, many valuable types will renew themselves; and, being better adjusted than at the beginning, may make remarkable success as cultures, and pass satisfactorily into the reproductive stages. Several types are reported by Professor Nieuwland as appearing year after year in the same jar.

7. In collecting, the best materials are usually to be had from small streams or ponds, in which the water almost or entirely dries up in summer or fall. It is good practise, even in the dry period, and particularly in winter when the vegetative stages of algæ may not be apparent, to collect some of the sticks, mud or soil, etc., from places in which desirable plants have been seen during the appropriate season. If this material is placed in laboratory jars, excellent laboratory cultures will often be developed in a few weeks. This indoor "forcing" of winter collections of algæ is a most decided aid to the teacher. It furnishes also a promising field of research for students in our laboratories.

8. On the other hand, by putting late-fruited species into jars, in the fall, and placing them in diffuse light in a cool place, they may be kept for weeks or even months with little change.

#### SUCCESSION OF MICRO-ORGANISMS IN FRESH WATER

Considerable interest has been shown recently by students, in the normal succession of micro-organisms in water, both in nature and in the somewhat artificial conditions of the laboratory. This is one of the phases of plankton work likely to be especially useful to teachers and to students. An especially well conceived and executed study of this sort has recently been reported and published by F. E. Fritch and F. Rich in the Proceedings of the Bristol Naturalists's Society for 1909. It extends over a period of five years and is from an inland body of water near Bristol.

The observers found that the dominant forms of algæ in the pond were *Cladophora*, *Spirogyra*, and numerous diatoms, both free-living and epiphytic. The chief subsidiary forms were *Edogonium*, *Mougeotia*, and various Cyanophyceæ. Among these forms the fol-

lowing periodic phases were noted, as forming an annual cycle: (1) A winter phase with free diatoms in abundance; (2) a spring phase with *Spirogyra* dominant; (3) a summer phase with *Cladophora* dominant and epiphytes abundant; and (4) an autumn phase in which many of the earlier forms become active again after a latent period. These include *Spirogyra*, *Edogonium*, or other forms. The authors classify and discuss the factors that operate to produce these changes as seasonal, irregular, and correlated. This kind of continued work with small bodies of water is needed in this country; and our own members can make valuable contributions to the ecology of our micro-organisms by such investigations in the neighborhood of their homes.

#### DISTRIBUTION OF ROTIFERS

In the *Journal* of the *Queckett Microscopical Club*, C. F. Rousselet offers a discussion of the distribution of Rotifers. He calls attention to the fact that most species have quite a cosmopolitan range; and that no continent or climatic zone can really claim a peculiar rotatorian fauna. Even the rarer species are reported from widely separated regions of the earth. These facts are of course to be coupled with the ease with which Rotifers are transported. Some of them, as is known, are even capable of being dried out and of resuming life when conditions become favorable. Even in species in which this is not true there are resting eggs that resist both cold and drouth. The fact that the habitat of many Rotifers is such that they or their eggs are liable to be dried up once or oftener each year, and thus to be committed to the winds, is likewise an important factor.

#### RELATION OF VITALITY OF PARAMECIUM TO CONSTANCY OF SURROUNDINGS

Mr. L. L. Woodruff states, in the *Biological Bulletin*, that Paramecia kept for generations in a reasonably constant culture medium undergo cyclical changes in protoplasmic vitality; and finally die from internal causes. If, however, the culture medium is kept changing in such a way as to disturb this cycle, the lowering of vitality may be prevented and the protoplasmic life may be continued without any apparent decrease of vitality. Possibly the cycle leading to senility may even be eliminated altogether in this way.